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**Železniške naprave - Pnevmatске polspojke**

Railway applications - Pneumatic half couplings

Bahnanwendungen - Bremskupplungen

Applications ferroviaires - Demi-accouplements pneumatiques

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## Railway applications - Pneumatic half couplings

Applications ferroviaires - Demi-accouplements  
pneumatiques

Bahnanwendungen - Bremskupplungen

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<b>Contents</b>	<b>Page</b>
European foreword.....	4
<b>1</b> <b>Scope</b> .....	<b>5</b>
<b>2</b> <b>Normative references</b> .....	<b>5</b>
<b>3</b> <b>Terms and definitions</b> .....	<b>6</b>
<b>4</b> <b>Symbols and abbreviations</b> .....	<b>6</b>
<b>5</b> <b>Design and manufacture</b> .....	<b>7</b>
<b>5.1</b> <b>Requirements</b> .....	<b>7</b>
<b>5.1.1</b> <b>Brake pipe</b> .....	<b>7</b>
<b>5.1.2</b> <b>Main reservoir pipe</b> .....	<b>7</b>
<b>5.1.3</b> <b>Flexible hose</b> .....	<b>7</b>
<b>5.1.4</b> <b>Sealing washers</b> .....	<b>10</b>
<b>5.1.5</b> <b>Coupling heads</b> .....	<b>11</b>
<b>5.1.6</b> <b>Nipple</b> .....	<b>12</b>
<b>5.1.7</b> <b>Hose Clip</b> .....	<b>12</b>
<b>5.2</b> <b>Compressed air quality</b> .....	<b>17</b>
<b>5.3</b> <b>Ambient temperature</b> .....	<b>18</b>
<b>5.4</b> <b>Environmental corrosion conditions</b> .....	<b>18</b>
<b>5.5</b> <b>Leakage</b> .....	<b>18</b>
<b>5.6</b> <b>Mechanical strength of assembly</b> .....	<b>18</b>
<b>5.7</b> <b>External appearance</b> .....	<b>18</b>
<b>5.8</b> <b>Fire behaviour</b> .....	<b>18</b>
<b>6</b> <b>Type test methods</b> .....	<b>18</b>
<b>6.1</b> <b>Sampling for type test</b> .....	<b>18</b>
<b>6.2</b> <b>Test requirements</b> .....	<b>18</b>
<b>6.3</b> <b>Test procedure flexible hose</b> .....	<b>19</b>
<b>6.3.1</b> <b>Nature and proportion of the tests and inspections</b> .....	<b>19</b>
<b>6.3.2</b> <b>Preparation of the test pieces</b> .....	<b>21</b>
<b>6.3.3</b> <b>Bend test</b> .....	<b>21</b>
<b>6.3.4</b> <b>Pressure test</b> .....	<b>22</b>
<b>6.3.5</b> <b>Bursting test</b> .....	<b>22</b>
<b>6.3.6</b> <b>Reinforcement adhesion test</b> .....	<b>23</b>
<b>6.3.7</b> <b>Test of dynamic fatigue through repeated tensile loadings of the internal and external layers</b> .....	<b>23</b>
<b>6.3.8</b> <b>Test for residual deformation through static tensile loading after ageing</b> .....	<b>23</b>
<b>6.3.9</b> <b>Impact test</b> .....	<b>23</b>
<b>6.3.10</b> <b>Test for Resistance to ozone cracking of the internal and external layers under static conditions</b> .....	<b>25</b>
<b>6.3.11</b> <b>Deflection at low temperature</b> .....	<b>26</b>
<b>6.3.12</b> <b>Test for fitting of connections on hoses</b> .....	<b>26</b>
<b>6.3.13</b> <b>Uncoupling test</b> .....	<b>28</b>
<b>6.3.14</b> <b>Flare test</b> .....	<b>29</b>
<b>6.3.15</b> <b>Hardness test</b> .....	<b>30</b>
<b>6.3.16</b> <b>Kink resistance test</b> .....	<b>30</b>
<b>6.3.17</b> <b>Influence of Oil</b> .....	<b>31</b>
<b>6.4</b> <b>Test procedure sealing washers</b> .....	<b>31</b>
<b>6.4.1</b> <b>Nature and proportion of the tests and inspections</b> .....	<b>31</b>
<b>6.4.2</b> <b>Preparation of the test pieces</b> .....	<b>32</b>
<b>6.4.3</b> <b>Hardness test</b> .....	<b>32</b>

6.4.4	Tensile strength test.....	32
6.4.5	Deformation tests .....	32
6.4.6	Water tightness test.....	34
6.4.7	Influence of oil .....	35
6.5	Test procedure pneumatic half coupling.....	35
6.5.1	Principle.....	35
6.5.2	Check of physical and geometrical characteristics .....	35
6.5.3	Hydraulic test of the assembly at given pressure .....	36
6.5.4	Leakage.....	36
6.5.5	Corrosion test.....	38
6.5.6	Pull test.....	38
6.6	Documentation .....	39
7	Routine test.....	39
8	In-Service assessment.....	39
9	Identification and marking .....	40
<b>Annex A (informative) MRP pneumatic half coupling for use in the United Kingdom .....</b>		<b>41</b>
A.1	Main reservoir pneumatic half coupling.....	41
A.2	General .....	43
A.3	Coupling head .....	43
A.4	Identification.....	43
<b>Annex B (informative) In-service trial.....</b>		<b>44</b>
B.1	General .....	44
B.2	Test set-up and sampling.....	44
B.3	Procedure .....	44
<b>(informative) Relationship between this European Standard and the essential requirements of Directive 2008/57/EC aimed to be covered.....</b>		<b>45</b>
<b>Bibliography .....</b>		<b>47</b>

**prEN 15807:2019 (E)****European foreword**

This document (prEN 15807:2019) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15807:2011.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

prEN 15807:2019 includes the following technical changes with respect to EN 15807:2011:

- the document has been revised generally;
- tolerances, tables and pictures have been updated;
- 5.8 “Fire behaviour” has been adapted due to EN 45545-1 and EN 45545-2;
- 5.1.3.5 “Adhesion of the reinforcement”: Nominal values have been adapted due to material parameters of the requested fire resistant material;
- 5.1.3.15 and 6.3.16 “Kink resistance test” has been added;
- 5.1.3.16 and 6.3.17 “Influence of oil” has been added;
- 5.1.6 “Nipple” and 5.1.7 “Hose clip” have been added;
- Annex A “Vacuum withstand” has been removed;
- Annex ZA has been updated.

## 1 Scope

This document applies to pneumatic half couplings designed to couple either the brake pipes or main reservoir pipes of railway vehicles, without taking the type of vehicles and track-gauge into consideration.

This document gives the requirements for the design, dimensions, testing and quality assurance of pneumatic half couplings.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1562, *Founding — Malleable cast irons*

EN 14478, *Railway applications — Braking — Generic vocabulary*

EN 45545-1, *Railway applications — Fire protection on railway vehicles — Part 1: General*

EN 45545-2, *Railway applications — Fire protection on railway vehicles — Part 2: Requirements for fire behaviour of materials and components*

EN 50125-1:2014, *Railway applications — Environmental conditions for equipment — Part 1: Rolling stock and on-board equipment*

EN ISO 8033:2017, *Rubber and plastics hoses — Determination of adhesion between components (ISO 8033:2016)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

ISO 37:2017, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48:2016, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 815, *Rubber, vulcanized or thermoplastic — Determination of compression set at ambient, elevated or low temperatures*

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1431-3, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 3: Reference and alternative methods for determining the ozone concentration in laboratory test chambers*

ISO 2285, *Rubber, vulcanized or thermoplastic — Determination of tension set under constant elongation, and of tension set, elongation and creep under constant tensile load*

ISO 8573-1:2010, *Compressed air — Part 1: Contaminants and purity classes*

ISO 10619-2:2017, *Rubber and plastics hoses and tubes — Measurement of flexibility and stiffness — Part 2: Bending tests*

ISO 23529:2016, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

**prEN 15807:2019 (E)****3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 14478 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

**3.1****brake coupling head**

components that, when mechanically coupled together, allow a flow of pressurised air between them

**3.2****nipple**

component at one end of the pneumatic half coupling that connects it to the end cock, or pipe, located on the vehicle

**3.3****hose clip**

component that mechanically fixes the hose to the coupling head or the nipple in order to assembly the pneumatic half coupling

**3.4****sealing washer**

component that is installed in the coupling head to prevent unacceptable loss of air when two coupling heads are connected to one another

**3.5****flexible hose**

component that is connected between the brake coupling head and the nipple to convey the pressurised air and give the required flexibility between vehicles, and that is generally made up of an elastic tube, textile reinforcement and elastomeric covering bonded together

**3.6****tube**

interior layer of the flexible hose

**3.7****reinforcement**

intermediate layer that provides the strength to maintain the general shape of the hose whilst giving the flexibility

**3.8****covering**

external layer of the flexible hose which protects the interior constituents from mechanical and environmental damage

**4 Symbols and abbreviated terms**

“	inch
BP	Brake Pipe
IRHD	International Rubber Hardness Degree
LO	a length of 20 mm marked on the calibrated part of the test piece
MRP	Main Reservoir Pipe



## 5 Design and manufacture

### 5.1 Requirements

#### 5.1.1 Brake pipe

The pneumatic half couplings for the automatic air brake pipe shall conform to Figure 1, Figure 3, Figure 5, Figure 6 or Figure 7 and Figure 9. The length of the assembled pneumatic half coupling, dimension X-X in Figure 1, is specified to suit the application, but the recommended length is 730 mm.

#### 5.1.2 Main reservoir pipe

The pneumatic half couplings for the main reservoir pipe shall conform to Figure 2, Figure 4, Figure 5, Figure 6 and Figure 9 for interoperable traffic. The length of the assembled pneumatic half coupling, dimension X-X in Figure 2, is specified to suit the application, but the recommended length is 730 mm. The nipple to connect to the end cock shall be as shown in Figure 1 (and is the same as for the air brake pipe) and shall have a truncated internal ISO 228 - G 1 1/4" pipe thread.

NOTE An alternative design of the MRP half coupling, as described in Annex A, is possible for use in the United Kingdom.

#### 5.1.3 Flexible hose

##### 5.1.3.1 General

The nominal internal diameter of the coupling hoses for both pipes shall be 28 mm. The length of the flexible hose is varied to suit the application, but should be the standard 620 mm to give the recommended length of 730 mm for dimension X-X as shown in Figure 1 and Figure 2. The recommended length of these hoses when used with a swing head autocoupler should be increased to give an assembled length of the pneumatic half coupling of 1 080 mm for the automatic air brake pipe and 930 mm for the main reservoir pipe. Elastomeric composite hoses having a textile reinforcing inlay sealed (vulcanised) at each end shall generally be used for these couplings, Figure 10, but hoses of other materials, e.g. metallic, may be used. The flexible hose shall conform to the dimensions defined in Figure 10. The choice of elastomers for elastomeric composite hoses is the choice of a manufacturer to meet the requirements of this specification. The elastomer used during a serial production shall conform with regard to the formulation of materials and characteristics to those products tested in the assessment procedure.

The tolerances for the overall length of the pneumatic half couplings shall be:

— < 1 000 mm	±5 mm,
— 1 000 mm to 2 499 mm	±10 mm,
— 2 500 mm to 6 000 mm	±30 mm,
— > 6 000 mm	±0,8 %.

The requirements 5.1.3.2 to 5.1.3.16 concern the elastomeric composite hoses.

##### 5.1.3.2 Bending

It shall be possible to bend the hose to form approximately a torus, without using a total force greater than 130 N for this operation, without folds appearing on the peripheral surface and without the maximum flattening recorded amounting to more than 16 % of the nominal external diameter of the hose.

This requirement shall be tested in accordance with 6.3.3.

**prEN 15807:2019 (E)****5.1.3.3 Behaviour under pressure**

After being subjected to an internal pressure of 13 bar for a period of 5 min, there shall be no apparent leak, swelling, or tear on the hose. The dimensional variations admitted under pressure conditions shall be as follows:

- variation in external diameter  $\pm 10\%$ ;
- variation in length  $\leq 3,5\%$ ;
- twist  $\leq 20^\circ/\text{m}$ .

In addition, after discontinuation of the test pressure after a waiting period of 3 min, the max. permanent deformation to the initial state of the hose shall be as follows even for any additional repetition test:

- variation in external diameter  $\pm 2\%$ ;
- variation in length  $\pm 2\%$ .

This requirement shall be tested in accordance with 6.3.4.

**5.1.3.4 Bursting pressure**

The bursting pressure, measured on the hose in delivery condition, shall not be less than 70 bar.

This requirement shall be tested in accordance with 6.3.5.

**5.1.3.5 Adhesion of the reinforcement**

The mean value of the force needed to separate the reinforcement and each of the layers shall not be less than:

- 2,5 N/mm for hoses tested in accordance with EN ISO 8033:2017, type 1 and type 2 in delivery condition, and
- 2,5 N/mm for hoses tested in accordance with EN ISO 8033:2017, type 1 and type 2 after ageing for 7 days at 70 °C, and
- 2,5 N/mm for hoses tested in accordance with EN ISO 8033:2017, type 1 and type 2 after interaction with oil in accordance with 6.3.17.

This requirement shall be tested in accordance with 6.3.6.

If the methods from EN ISO 8033:2017, type 1 or type 2 are not appropriate to a specific design of half coupling, another method from EN ISO 8033 may be used. The criteria of acceptance is then defined before the test on a case-by-case basis.

**5.1.3.6 Resistance of the internal and external layers of the hose to repeated tensile loads**

The internal and external layers of the hose, when subjected to successive repeated tensile loads, shall withstand, in accordance with the conditions defined in 6.3.7

- 400 tensile loadings for hoses tested in delivery condition,
- 350 tensile loadings for hoses tested after ageing for 7 days at 70 °C.

This requirement shall be tested in accordance with 6.3.7.

**5.1.3.7 Residual deformation through static tensile loading of the internal layer of the hose**

After tensile loading, the test piece taken from the internal layer of the hose and tested after ageing for 7 days at 70 °C, shall not be more than  $L_0 + 12\%$  in length.

This requirement shall be tested in accordance with 6.3.8.

### 5.1.3.8 Impact resistance

After being subjected to the impact of a weight of 10 kg dropped from a height of 1 m, the bursting pressure of the hose shall not be less than 70 bar.

This requirement shall be tested in accordance with 6.3.9.

### 5.1.3.9 Resistance to ozone cracking of the internal and external layers of the hose under static conditions

The internal and external layers of the hose, after exposure to an ozone-enriched atmosphere, shall not show signs of cracking visible with a magnifying glass with a magnifying power of 7 X.

This requirement shall be tested in accordance with 6.3.10.

### 5.1.3.10 Behaviour at low temperature

The deflection of the hose as measured at the end of a length of 250 mm, 3 s after application of a load of 20 N at  $-30\text{ }^{\circ}\text{C}$ , shall not be less than 20 mm.

If the brake coupling is used for temperatures up to  $-40\text{ }^{\circ}\text{C}$ , an additional temperature test shall be performed.

This requirement shall be tested in accordance with 6.3.11.

After bending and regaining ambient temperature, the hose shall pass a burst pressure test in accordance with 5.1.3.4.

### 5.1.3.11 Ease of assembly of connections on the hoses

It shall be possible for the connections to be easily mounted on the hoses under the conditions stipulated in 6.3.12 so that the end of the hose makes clean contact with the shoulder of the connection. The centre lines of the hose and connection shall be in alignment after assembly.

This requirement shall be tested in accordance with 6.3.12.

### 5.1.3.12 Resistance to uncoupling of connections on the hoses

Uncoupling of the connection of the hose to the end fittings shall not occur when the pressure is less than 20 bar when the hose has been inserted as prescribed in 5.1.3.11 and the hose clamp has been tightened using the minimum force prescribed in the assembly instructions for the pneumatic half coupling.

This requirement shall be tested in accordance with 6.3.13.

### 5.1.3.13 Elongation resistance

After an elongation, the linings and layers shall neither tear nor become detached. The inspection shall cover the visible outer surfaces, and it shall be performed with the naked eye.

Moreover, the residual widening in any part of the hose shall not exceed 2 % after a waiting period of (2+1) min.

This requirement shall be tested in accordance with 6.3.14.

### 5.1.3.14 Hardness

Requirements for hardness are the following:

- Hardness in delivery condition at  $(23 \pm 2)\text{ }^{\circ}\text{C}$ : Manufacturers stated nominal IRHD with a tolerance of  $\pm 5$  IRHD.
- Hardness after ageing for 7 days at  $70\text{ }^{\circ}\text{C}$ : Hardness recorded after ageing shall not deviate by more than  $\pm 5$  IRHD from the value recorded before ageing.

This requirement shall be tested in accordance with 6.3.15.

**prEN 15807:2019 (E)****5.1.3.15 Kink resistance**

There shall be no observable permanent deformation or structural damage and no hose delamination after the kink resistance test.

NOTE When the hose is bent at too sharp an angle, it can kink and shorten the effective hose life, and any such kinking is not an acceptable or safe practice, but it happens. The requirement for a kink resistance test is included to prevent potential problems with hose kinking in actual field use.

The requirement shall be tested in accordance with 6.3.16.

**5.1.3.16 Oil resistance of the inner hose and cover**

Under the influence of oil, the variation in volume of the inner hose and the cover shall be between 0 % and +15 %. If no samples with a thickness of  $(2 \pm 0,2)$  mm can be taken, a deviation in volume of 20 % is permitted.

This requirement shall be tested in accordance with 6.3.17.

**5.1.4 Sealing washers****5.1.4.1 Dimensions**

The dimensional specifications of the sealing washers shall be in accordance with Figure 9.

**5.1.4.2 Hardness**

Requirements for hardness are the following:

- Hardness in delivery condition at  $(23 \pm 2)$  °C: 65 IRHD with a tolerance of  $\pm 5$  IRHD.
- Hardness after ageing for 7 days at 70 °C: Hardness recorded after ageing shall not deviate by more than 5 IRHD from the value recorded before ageing.

This requirement shall be tested in accordance with 6.4.3.

**5.1.4.3 Tensile characteristics**

a) In delivery condition:

- 1) ultimate tensile strength  $\geq 10$  MPa;
- 2) elongation at break  $\geq 300$  %;

b) After ageing for 7 days at 70 °C:

Characteristics recorded after ageing shall not deviate from those recorded prior to ageing by more than:

- 1) 20 % for ultimate tensile strength,
- 2) 30 % for elongation at break.

This requirement shall be tested in accordance with 6.4.4.

#### 5.1.4.4 Deformation resistance

Deformation tests shall be carried out at high and low temperature. The test set out in 5.1.4.4, a) or those specified in 5.1.4.4, b) shall be performed:

a) Deformation under tensile test:

- 1) tension set under 50 % elongation for 24 h at 70 °C:  $\leq 10$  %;
- 2) flexibility test at  $-25$  °C and under 50 % compression, carried out in delivery condition:  $\leq 8$  %.

b) Deformation under compression test:

- 1) compression set following compression for 22 h at 70 °C:  $\leq 25$  %;
- 2) compression set following compression for 22 h at  $-30$  °C:  $\leq 60$  %.

This requirement shall be tested in accordance with 6.4.5.

#### 5.1.4.5 Water tightness

Two coupling heads, fitted with sealing washers and joined together to simulate service conditions and immersed in water, shall be watertight round the sealing washers and allow no visible leakage (no air bubbles) under the effect of 0,5 bar air pressure.

This requirement shall be tested in accordance with 6.4.6.

#### 5.1.4.6 Oil resistance of the sealing washer

Under the influence of oil, the variation in hardness and volume of test pieces shall be in conformity with the maximum deviations defined in Table 1.

**Table 1 — Maximum deviations permitted**

	<b>Samples dipped in mineral oil generally used for railway applications, for example Rimula R6 ME (5W-30)</b>	<b>Samples dipped in synthetic oil generally used for railway applications, for example Alphasyn T46</b>
$\Delta$ hardness (DIDC) %	0 / +10	+5 / -10
$\Delta$ volume %	0 / -12	+10 / -5

This requirement shall be tested in accordance with 6.4.7.

#### 5.1.5 Coupling heads

The coupling heads for the BP shall conform to Figure 3, Figure 5 and Figure 6 or Figure 7. The coupling head for the MRP shall conform to Figure 4, Figure 5 and Figure 6 or Figure 7. All the figures show the mandatory dimensions to ensure coupling, but the shape and the other dimensions are able to be varied, provided the heads are designed to offer the least possible resistance to airflow. The sealing washer shown in Figure 9 shall be used.

The material of the coupling heads shall be of EN-GJS-400-15 in accordance with EN 1563, EN-GJMB-350-10 in accordance with EN 1562, EN-GJMW-400-05 in accordance with EN 1562.

It is permitted to use other material if equivalent characteristics are demonstrated.